

NO  
104  
cancel  
comprises a CPU on the substrate.

102. (New) A method according to claim 93, wherein said semiconductor device comprises a CPU on the substrate.--

### REMARKS

At the outset the Examiner is thanked for the review and consideration of the present application.

The Examiner's Final Office Action dated June 6, 2002 has been received and its contents reviewed. Filed concurrently herewith is a Request for a Two (2) Month Extension of Time which extends the shortened statutory period for response to November 6, 2002. Accordingly, Applicants respectfully submit that this response is being timely filed.

Claims 24-92 were pending in the present application. By this Amendment, claims 24-75 have been cancelled, claims 76-92 have been amended, and new claims 93-102 have been added. Accordingly, claims 76-102 are pending, of which claims 76, 80, 84, 88, and 93 are independent.

Turning now to the Office Action, claims 24, 31, 32, 40, 49, 50, 55, and 66-92 are objected to under 35 U.S.C. §112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.. More particularly, the abbreviation "CPU" is undefined. Further, the acronym LDD is undefined, and the relative terms "lightly" in claims 66-70, and "momentarily" in claims 31, 40, 49, and 55, as well as "rapid" and "strong" in claims 76-92, are also not defined. Still further, claims 24, 32, 50, and 76 are objected to as containing non-idiomatic English.

In response, Applicants have amendment the specification, as shown above, to replace "CPU" with "Central Processing Unit" and amended claims 76-92, as shown above to remove the relative terms and correct non-idiomatic English. Further, with the cancellation of claims 24-75, the remaining §112, second paragraph, objections are now rendered moot.

For the Examiner's reference, Applicants are submitting herewith a copy of the definition of "CPU", as defined in the McGraw-Hill Dictionary of Scientific and Technical Terms, which Applicants has understood and applied in the present specification.

Claims 31, 40, 49, 55, and 70-92 are rejected under 35 U.S.C. §112, first paragraph, as

containing subject matter which is not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventors, at the time the invention was filed, had possession of the claimed invention. More particularly, the Examiner asserts that pages 17-18, which discuss “fused” in an example using a Ni-containing layer, imparts the crystallinity by using the combination of both heat and irradiation simultaneously, and, therefore, provides no support for the claimed “momentarily fuses” with previous crystallization. Further, the Examiner asserts that in embodiment 2 on page 20, where heating and irradiation are done sequentially, no fusing is discussed, and the original claims did not discuss fusing. Hence, claims 31, 40, 49, and 55 contains new matter (both the momentarily and fused) for the claims as written. The Examiner also asserts that there is no disclosure of the invention that crystallizes the semiconductor layer without the use of “a catalyst element” at the broadest disclosure, hence all the new claims 76-92 contain new matter.

Further, the Examiner asserts that on page 11, “strong light” exemplified only by IR is taught as an alternative to laser light, not as the heat source for the disclosed heat treating from 450-750°C. All examples using light, illustrated in Fig. 8 use Ni catalyst, hence provide no support for Applicants’ new claims 76-92. The Examiner also asserts that Embodiment 4 fails to provide support for Applicants’ broadly claimed procedure that do not use Ni as a catalyst, or any catalyst, do not heat with laser, and claim generic rapid thermal annealing in stead of IR, follows by a long thermal annealing process.

Still further, claims 76-92 are rejected under 35 U.S.C. §112, second paragraph, because the specification, while being enabling for various combination of laser/light and heat treatment crystallization processes using a catalytic element to promote or accelerate crystallization, does not reasonably provide enablement for crystallization without the catalyst, or without heat other than RTA supplied during the sequence of crystallization steps. Further, since new claims 76-92 are replete with new matter, the claims do not have the benefit of the foreign priority date provided with the certification.

Claims 31, 40, 49, 50, and 76-92 are rejected under 35 U.S.C. § 103(a) obvious over Ohtani et al. (U.S. Patent No. 5,543,352 – hereafter Ohtani) in view of Zhang et al. (U.S. Patent No. 5,529,937) or vice versa, optionally in view of Liu et al. (‘826) or Zhang (‘291). Further, claims 76-78, 80-82, 84-86, 88-90, and 92 are rejected under 35 U.S.C. § 102(e) as clearly

anticipated by Ohtani, and claims 24-75 are rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-20 of Ohtani, in view of Zhang ('937), optionally further in view of Liu et al. '826) or Zhang '291). Still further, claims 50-51, 53-55, 69-74 are rejected under 35 U.S.C. § 103(a) as unpatentable over Mitnaga et al. (U.S. Patent No. 5,808,321), and claims 76-92 are rejected under 35 U.S.C. § 102(e) as clearly anticipated by Mitnaga et al.

In response to the above-listed rejections, Applicants respectfully traverse for the reasons provided below.

One of the features of the present invention is a method of fabricating a semiconductor device comprising: forming a semiconductor film over a substrate having an insulating surface; irradiating the semiconductor film with a laser light; then annealing the irradiated semiconductor film with a light; and then patterning the semiconductor film to form at least one semiconductor island. These features are disclosed in Embodiment 4 in the present specification. As amended, claims 76-92 recite these features, and new claims 93-102 also recite these features.

With respect to the Examiner's assertion of claims 76-92 containing new matter, Applicants respectfully submit that the specification teaches an example of TFT formed by not using a metal element, as disclosed in Embodiment 9.

With respect to the §102(e) rejection of claims 76-92 as clearly anticipated by Ohtani in view of Zhang, optionally in view of Liu or Zhang ('291), Applicants respectfully submit that the cited prior art references fail to disclose Applicants' above-discussed claimed method of fabricating a semiconductor device comprising: forming a semiconductor film over a substrate having an insulating surface; irradiating the semiconductor film with a laser light; then annealing the irradiated semiconductor film with a light; and then patterning the semiconductor film to form at least one semiconductor island.

Applicants' argument to the §102(e) rejection as set forth above is also applicable to the §103(a) rejection and the double patenting rejection over Ohtani in view of Zhang, optionally in view of Liu or Zhang ('291). Additionally, Applicants' argument to the §102(e) rejection as set forth above is also applicable to the §102(e) rejection, as well as §103(a) rejection, over Mitnaga et al.

Moreover, as claims 24-75 have been cancelled, and claims 76-92 have been amended, as

shown above, the rejections of these claims are now rendered moot.


In view of the arguments and amendments set forth above, Applicants respectfully request reconsideration and withdrawal of all of the pending rejections and objections.

**CONCLUSION**

Having responded to the rejection set forth in the outstanding non-Final Office Action, it is submitted that claims 76-102 are now in condition for allowance. An early and favorable Notice of Allowance is respectfully solicited. In the event that the Examiner is of the opinion that a brief telephone or personal interview will facilitate allowance of one or more of the above claims, the Examiner is courteously requested to contact Applicants' undersigned representative.

Respectfully submitted,

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**MARKED-UP COPY OF AMENDED CLAIMS.**

76. (Amended) A method of fabricating a semiconductor device comprising [steps of]:  
forming a semiconductor film over a substrate having an insulating surface;  
[performing a laser irradiation to] irradiating the semiconductor film with a laser light [to  
proceed crystallization of the semiconductor film]; [and] then  
[performing a rapid thermal anneal to] annealing the irradiated semiconductor film with a  
[strong] light [to proceed crystallization of the semiconductor film]; and then  
patterning the semiconductor film to form at least one semiconductor island.

77. (Amended) A method according to claim 76 wherein said laser light is selected from  
the group consisting of KrF, XeCl, XeF, and ArF.

78. (Amended) A method according to claim 76 wherein said [strong] light is an infrared  
light.

79. (Amended) A method according to claim 76 further comprising a step of [forming at  
least one semiconductor island by patterning the semiconductor film after the rapid thermal  
anneal] forming at least channel, source, and drain regions in the semiconductor island layer of  
the semiconductor film by introducing impurities therein.

80. (Amended) A method of fabricating a semiconductor device comprising [steps of]:  
forming an insulating film on a substrate;  
forming a semiconductor film [over a substrate having an insulating surface] on the  
insulating film;  
[performing a heat treatment to the semiconductor film];  
[performing a laser irradiation to] irradiating the [heated] semiconductor film with a laser  
[beam] light; and then  
[performing a rapid thermal anneal to] annealing the irradiated semiconductor film with a  
[strong] light; and then

patterning the semiconductor film to form at least one semiconductor island.

81. (Amended) A method according to claim 80 wherein said laser light is selected from the group consisting of KrF, XeCl, XeF, and ArF.

82. (Amended) A method according to claim 80 wherein said [strong] light is an infrared light.

83. (Amended) A method according to claim 80 further comprising a step of [forming at least one semiconductor island by patterning the semiconductor film after the rapid thermal anneal] forming at least channel, source, and drain regions in the semiconductor island layer of the semiconductor film by introducing impurities therein.

84. (Amended) A method of fabricating a semiconductor device comprising [steps of]:  
forming a semiconductor film over a substrate having an insulating surface;  
introducing a material [for promoting crystallization of the semiconductor film]  
comprising metal to the semiconductor film;  
[performing a laser irradiation to] irradiating the semiconductor film with a laser light;  
[and] then  
[performing a rapid thermal anneal to] annealing the irradiated semiconductor film with a  
[strong] light; and then  
patterning the semiconductor film to form at least one semiconductor island.

85. (Amended) A method according to claim 84 wherein said laser light is selected from the group consisting of KrF, XeCl, XeF, and ArF.

86. (Amended) A method according to claim 84 wherein said [strong] light is an infrared light.

87. (Amended) A method according to claim 84 [further comprising a step of forming at

least one semiconductor island by patterning the semiconductor film after the rapid thermal anneal] wherein said metal is at least one selected from the group consisting of Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, Pt, Cu, Ag and Au.

88. (Amended) A method of fabricating a semiconductor device comprising [steps of]:  
forming a semiconductor film over a substrate having an insulating surface;  
crystallizing the semiconductor film by a laser irradiation with a laser light; [and] then  
[performing a rapid thermal anneal to] annealing the irradiated semiconductor film with a  
[strong] light so as to improve crystallinity of the semiconductor film;  
heating the annealed semiconductor film in an atmosphere comprising nitrogen; and then  
patterning the semiconductor film to form at least one semiconductor island.

89. (Amended) A method according to claim 88 wherein said laser light is selected from the group consisting of KrF, XeCl, XeF, and ArF.

90. (Amended) A method according to claim 88 wherein said [strong] light is an infrared light.

91. (Amended) A method according to claim [88] 84 further comprising a step of forming at least [one semiconductor island by patterning the semiconductor film after the rapid thermal anneal] channel, source, and drain regions in the semiconductor island layer of the semiconductor film by introducing impurities therein.

92. (Amended) A method according to claim 88 further comprising a step of forming at least channel, source, and drain[, and LDD] regions in the semiconductor island layer of the semiconductor film by introducing impurities therein.

## MARKED-UP COPY OF AMENDED SPECIFICATION:

***Page 27, sixth paragraph entitled Embodiment 7, and continuing onto page 28:***

(Amended) Fig. 7 is a block figure of an electro-optical system using an integrated circuit in which a display, [CPU] central processing unit, memory, etc. are provided on a single glass substrate. An input port reads an externally input signal and converts it to an image signal. A correction memory corrects an input signal etc. in accordance with the characteristics of an active matrix panel, and is therefore dedicated to the panel. In particular, this correction memory is a fixed memory that has information specific to the respective pixels to allow individual corrections for those pixels. More specifically, where an electro-optical device has a point-defect pixel, signals corrected for that pixel are supplied to pixels around that pixel, to thereby cover the point defect, i.e., make it unrecognizable. Where a certain pixel is darker than pixels around it, a larger signal is supplied to that pixel to make the brightness of it be the same level as that of the adjacent pixels.

***Page 28, first full paragraph:***

(Amended) The [CPU] central processing unit and the memory are of the same kinds as in an ordinary computer. In particular, the memory includes, as a RAM, an image memory corresponding to the respective pixels. Also, the intensity of back light which irradiates from the back side of the substrate can be changed in accordance with image information.



# **McGraw-Hill Dictionary of Scientific and Technical Terms**

## **Fifth Edition**

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Editor in Chief

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## centralized traffic control

## centrifugal filter 337

usually with fixed equipment within one building. ( 'sen-trə, līz 'dād-ə 'prās, əs-ŋ )

**centralized traffic control** [CIV ENG] Control of train movements by signal indications given by a train director at a central control point. Abbreviated CTC. ( 'sen-trə, līz 'trafik kən-trōl )

**centralizer** [MATH] The subgroup consisting of all elements which commute with a given element of a group. (PETRO ENG) See casing centralizer. ( 'sen-trə, līz-ər )

**central-limit theorem** [STAT] The theorem that the distribution of sample means taken from a large population approaches a normal (Gaussian) curve. ( 'sen-trəl 'līm-ət, thī-rəm )

**central mean operator** [MATH] A difference operator, denoted  $\mu$ , defined by the equation  $\mu f(x) = [f(x + h/2) + f(x - h/2)]/2$ , where  $h$  is a constant denoting the difference between successive points of interpolation or calculation. Also known as averaging operator. ( 'sen-trəl 'mēn 'āp-ə, rād-ər )

**central meridian** [ASTRON] The meridian of a planet that crosses the center of the visible face of the planet at a given instant. ( 'sen-trəl mə'rīd-ē-ən )

**central-meridian transit** [ASTRON] The passage of an object on the surface of a planet across the central meridian. ( 'sen-trəl mə'rīd-ē-ən 'tranz-ət )

**central mix concrete** [MATER] A concrete prepared at a concrete mixing plant and transported to the building site. ( 'sen-trəl 'miks 'kæg, krēt )

**central nervous system** [ANAT] The division of the vertebrate nervous system comprising the brain and spinal cord. ( 'sen-trəl 'nɔrvəs, sist-əm )

**central office** [COMMUN] A switching unit, installed in a telephone system serving the general public, having the necessary equipment and operating arrangements for terminating and interconnecting lines and trunks. Also known as telephone central office. ( 'sen-trəl 'ōfīs )

**central office line** See subscriber line. ( 'sen-trəl 'ōfīs, līn )

**central orbit** [MECH] The path followed by a body moving under the action of a central force. ( 'sen-trəl 'or-bīt )

**central paralysis** [MED] Paralysis due to a lesion of the brain or spinal cord. ( 'sen-trəl pə'rāl-ə'səs )

**central peak** [ASTRON] A mountain located at the center of the floor of a lunar crater. ( 'sen-trəl 'pēk )

**central placentation** [BOT] Having the ovules located in the center of the ovary. ( 'sen-trəl, plə'sən'tā-shən )

**central plane** [MATH] For a fixed ruling of a ruled surface, the plane tangent to the surface at the central point of the ruling. ( 'sen-trəl 'plān )

**central pocket loop** [ANAT] A whorl type of fingerprint pattern having two deltas and at least one ridge that make a complete circuit. ( 'sen-trəl 'pāk-ət, lūp )

**central point** [MATH] For a fixed ruling  $L$  on a ruled surface, the limiting position, as a variable ruling  $L'$  approaches  $L$ , of the foot on  $L$  of the common perpendicular to  $L$  and  $L'$ . ( 'sen-trəl 'pōint )

**central pressure** [METEOROL] At any given instant, the atmospheric pressure at the center of a high or low; the highest pressure in a high, the lowest pressure in a low. ( 'sen-trəl 'presh-ər )

**central processing unit** [COMPUT SCI] The part of a computer containing the circuits required to interpret and execute the instructions. Abbreviated CPU. ( 'sen-trəl 'prās, əs-ŋ, yū-nīt )

**central-processing-unit time** [COMPUT SCI] The time actually required to process a set of instructions in the logic unit of a computer. ( 'sen-trəl 'prās, əs-ŋ, yū-nēt, tīm )

**central projection** [MATH] A mapping of a configuration into a plane that associates with any point of the configuration the intersection with the plane of the line passing through the point and a fixed point. ( 'sen-trəl prə'jek-shən )

**central quadric** [MATH] A quadric surface that has a center, namely, a sphere, ellipsoid, or hyperboloid. ( 'sen-trəl 'kwā-drik )

**central sulcus** [ANAT] A groove situated about the middle of the lateral surface of the cerebral hemisphere, separating the frontal from the parietal lobe. ( 'sen-trəl 'səl-kəs )

**central terminal** [COMPUT SCI] A communication device which queues tellers' requests for processing and which channels answers to the consoles originating the transactions. ( 'sen-trəl 'tərm-nəl )

**central valley** See rift valley. ( 'sen-trəl 'val-ē )

**central water** [OCEANOGR] Upper water mass associated with the central region of oceanic gyre. ( 'sen-trəl 'wōd-ər )

**Centrarchidae** [VERT ZOO] A family of fishes in the order Perciformes, including the fresh-water or black basses and several sunfishes. ( ,sen'trärk-ə,dē )

**centric** [ANAT] Having all teeth of both jaws meet normally with perfect distribution of forces in the dental arch. ( 'sen-trik )

**centrifugal** [MECH] Acting or moving in a direction away from the axis of rotation or the center of a circle along which a body is moving. ( ,sen'trif-i-gəl )

**centrifugal atomizer** [MECH ENG] Device that atomizes liquids with a spinning disk; liquid is fed onto the center of the disk, and the whirling motion (3000 to 50,000 revolutions per minute) forces the liquid outward in thin sheets to cause atomization. ( ,sen'trif-i-gəl 'ad-ə,mīz-ər )

**centrifugal barrier** [MECH] A steep rise, located around the center of force, in the effective potential governing the radial motion of a particle of nonvanishing angular momentum in a central force field, which results from the centrifugal force and prevents the particle from reaching the center of force, or causes its Schrödinger wave function to vanish there in a quantum-mechanical system. ( ,sen'trif-i-gəl 'bar-ē-ər )

**centrifugal brake** [MECH ENG] A safety device on a hoist drum that applies the brake if the drum speed is greater than a set limit. ( ,sen'trif-i-gəl 'brāk )

**centrifugal casting** [ENG] A method for casting metals or forming thermoplastic resins in which the molten material solidifies in and conforms to the shape of the inner surface of a heated, rapidly rotating container. ( ,sen'trif-i-gəl 'kast-iŋ )

**centrifugal clarification** [MECH ENG] The removal of solids from a liquid by centrifugal action which decreases the settling time of the particles from hours to minutes. ( ,sen'trif-i-gəl ,klari-fə'kā-shən )

**centrifugal classification** [MECH ENG] A type of centrifugal clarification purposely designed to settle out only the large particles (rather than all particles) in a liquid by reducing the centrifuging time. ( ,sen'trif-i-gəl ,klas-ə-fə'kā-shən )

**centrifugal classifier** [MECH ENG] A machine that separates particles into size groups by centrifugal force. ( ,sen'trif-i-gəl 'klas-ə,fī-ər )

**centrifugal clutch** [MECH ENG] A clutch operated by centrifugal force from the speed of rotation of a shaft, as when heavy expanding friction shoes act on the internal surface of a rim clutch, or a flyball-type mechanism is used to activate clutching surfaces on cones and disks. ( ,sen'trif-i-gəl 'kləch )

**centrifugal collector** [MECH ENG] Device used to separate particulate matter of 0.1-1000 micrometers from an airstream; some types are simple cyclones, high-efficiency cyclones, and impellers. ( ,sen'trif-i-gəl ka'lek-tər )

**centrifugal compressor** [MECH ENG] A machine in which a gas or vapor is compressed by radial acceleration in an impeller with a surrounding casing, and can be arranged multistage for high ratios of compression. ( ,sen'trif-i-gəl kəm'pres-ər )

**centrifugal cutout** [ELEC] A switch that is opened by centrifugal force and is usually closed by a spring when the centrifugal force is reduced. ( ,sen'trif-i-gəl 'kad,aut )

**centrifugal discharge elevator** [MECH ENG] A high-speed bucket elevator from which free-flowing materials are discharged by centrifugal force at the top of the loop. ( ,sen'trif-i-gəl 'dis,charj, el-ə,vād-ər )

**centrifugal distortion** [PHYS] Tendency of a molecule to stretch slightly as its speed of rotation increases. ( ,sen'trif-i-gəl dī'stōr-shən )

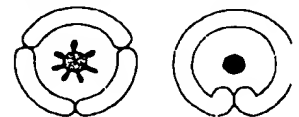
**centrifugal drainage pattern** See radial drainage pattern. ( ,sen'trif-i-gəl 'drān-iŋ, pad-əm )

**centrifugal extractor** [CHEM ENG] A device for separating components of a liquid solution, consisting of a series of perforated concentric rings in a cylindrical drum that rotates at 2000-5000 revolutions per minute around a cylindrical shaft; liquids enter and leave through the shaft; they flow radially and concurrently in the rotating drum. ( ,sen'trif-i-gəl ik'strak-tər )

**centrifugal fan** [MECH ENG] A machine for moving a gas, such as air, by accelerating it radially outward in an impeller to a surrounding casing, generally of scroll shape. ( ,sen'trif-i-gəl 'fan )

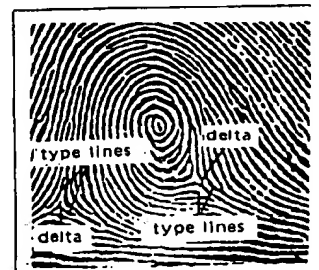
**centrifugal filter** [ENG] An adaptation of the centrifugal settler; centrifugal action of a spinning container segregates heavy

## CENTRAL PLACENTATION



Free central placentation, ovules shown in black.

## CENTRAL POCKET LOOP



Central pocket loop, a type of whorl pattern. (Federal Bureau of Investigation)

**coyote-hole blasting** See coyote blasting. ( 'kī,ōd-ē,hōl,blast-  
ing )

**COZI** [COMMUN] An ionospheric sounding system for determining propagation characteristics of the ionosphere at various angles at any instant; used to determine how well long-distance, high-frequency broadcasts are reaching their intended destinations. Derived from communications zone indicator. ( 'kō;zi )

**cp** See candlepower; centipoise; chemically pure.

**cpa** See color-phase alternation.

**CPD** See cephalopelvic disproportion.

**CPE** See computer performance evaluation.

**CP invariance** [PARTIC PHYS] The principle that the laws of physics are left unchanged by a combination of the operations of charge conjugation *C* and space inversion *P*; a small violation of this principle has been observed in the decay of neutral *K*-mesons. ( 'sē,pē in'ver-ē-ōns )

**C<sub>3</sub> plant** [BOT] A plant that produces the 3-carbon compound phosphoglyceric acid as the first stage of photosynthesis. ( 'sē'thrē,plant )

**C<sub>4</sub> plant** [BOT] A plant that produces the 4-carbon compound oxalocethanoic (oxaloacetic) acid as the first stage of photosynthesis. ( 'sē'fōr,plant )

**cpm** See cycle per minute.

**CPM** See critical path method.

**C power supply** [ELECTR] A device connected in the circuit between the cathode and grid of a vacuum tube to apply grid bias. ( 'sē'paur sō,plī )

**CP propeller** See controllable-pitch propeller. ( 'sē,pē prō'pel-  
or )

**CPR** See cardiopulmonary resuscitation.

**cps** See hertz.

**CPT theorem** [PARTIC PHYS] A theorem which states that a Lorentz invariant field theory is invariant to the product of charge conjugation *C*, space inversion *P*, and time reversal *T*. ( 'sē,pē,tē'thīr-ōm )

**CPU** See central processing unit.

**CPU-bound program** [COMPUT SCI] A computer program that involves a large amount of calculation and internal rearrangement of data, so that the speed of execution depends on the speed of the central processing unit (CPU) and memory. Also known as compute-bound program; cycle-bound program; process-bound program. ( 'sē,pē'yū 'baund,prō-gram )

**Cr** See chromium.

**CR** See catalytic reforming.

**CrA** See Corona Australis.

**crab** [INV ZOO] 1. The common name for a number of crustaceans in the order Decapoda having five pairs of walking legs, with the first pair modified as chelipeds. 2. The common name for members of the Merostoma. [NAV] To drift sideways or to leeward, as a ship. ( 'krab )

**crabapple** [BOT] Any of several trees of the genus *Malus*, order Rosales, cultivated for their small, edible pomes. ( 'krab,ap-əl )

**crabbing** [NAV] The horizontal attitude of an aircraft in flight when a crosswind causes its heading to differ from the course. [TEXT] A finishing process that sets warp and weft threads by winding the fabric on a roller under tension and then boiling or steaming. ( 'krab-īng )

**crab locomotive** [MIN ENG] A type of trolley locomotive equipped with an electric motor, a drum, and haulage cable mounted on a small truck; used to haul mine cars from workings. ( 'krab lō-kā'mōd-iv )

**Crab Nebula** [ASTRON] A gaseous nebula in the constellation Taurus; an amorphous mass which radiates a continuous spectrum involved in a mesh of filaments that radiate a bright-line spectrum. ( 'krab 'neb-yā-lā )

**Crab pulsar** [ASTRON] A pulsar found in the center of the Crab Nebula with a period of about 0.033 second and that emits radiation at all wavelengths from the radio to the x-ray region. ( 'krab 'pāl,sār )

**crachin** [METEOROL] A period of light rain accompanied by low stratus clouds and poor visibility which frequently occurs in the China Sea between January and April. ( 'krā-chīn )

**Cracidae** [VERT ZOO] A family of New World tropical upland game birds in the order Galliformes; includes the chachalacas, guans, and curassows. ( 'krā-sā,dē )

**crack** [CHEM] To break a compound into simpler molecules.

[ENG] To open something slightly, for instance, a valve. [SCI TECH] A fissure. ( 'krak )

**crack arrester** [NAV ARCH] 1. On a ship, a plate riveted over another plate where the latter has a crack or a stressed area where a crack might begin. 2. A hole or slot formed at the end of a crack to keep it from spreading, or in a stressed area to prevent a crack from beginning. ( 'krak ə'rest-ər )

**cracked** [MATER] Applied to those oils produced by the cracking process rather than straight distillation. ( 'krakt )

**cracked gasoline** [MATER] Gasoline manufactured by heating crude petroleum distillation fractions or residues under pressure, or by heating with or without pressure in the presence of a catalyst, so that heavier hydrocarbons are broken into others, some of which distill in the gasoline range. ( 'krakt 'gō-  
ə,lēn )

**cracked residue** [CHEM ENG] The residue of fuel resulting from decomposition of hydrocarbons during thermal or catalytic cracking. ( 'krakt 'rez-ə,dū )

**cracked stem** [PL PATH] A boron-deficiency disease of celery characterized by brown mottling of leaves and brittleness and cracking of leaf stalks. ( 'krakt,stem )

**cracking** [CHEM ENG] A process that is used to reduce the molecular weight of hydrocarbons by breaking the molecular bonds by various thermal, catalytic, or hydrocracking methods.

[ENG] Presence of relatively large cracks extending into the interior of a structure, usually produced by overstressing the structural material. ( 'krak-īng )

**cracking coil** [CHEM ENG] A coil used for cracking heavy petroleum products. ( 'krak-īng,kōil )

**cracking still** [CHEM ENG] The furnace, reaction chamber, and fractionator for thermal conversion of heavier charging stock to gasoline. ( 'krak-īng,stīl )

**cracovian** [MATH] An object which is the same as a matrix except that the product of cracovians *A* and *B* is equal to the matrix product *A'B*, where *A'* is the transpose of *A*. ( 'krāk-  
vē-ən )

**cradle** [CIV ENG] A structure that moves along an inclined track on a riverbank and is equipped with a horizontal deck carrying tracks for transferring railroad cars to and from boats at different water elevations. [ENG] A framework or other resting place for supporting or restraining objects. [ORD] The nonrecoiling structure of a weapon that houses the recoiling parts and rotates to elevate the gun. [TEXT] A device that catches the cards as they fall from a jacquard head. ( 'krād-  
əl )

**cradle cap** [MED] Heavy, greasy crusts on the scalp of an infant; seborrheic dermatitis of infants. ( 'krād-əl,kap )

**cradle dump** [MIN ENG] A tippie which dumps cars with a rocking motion. ( 'krād-əl,dəmp )

**cradle printing** [GRAPHICS] Early printing of a crude sort done from movable types. Also known as incunabula printing. ( 'krād-əl,prīnt-īng )

**cradle vault** See barrel vault. ( 'krād-əl,vōlt )

**crag** [GEOL] A steep, rugged point or eminence of rock, one projecting from the side of a mountain. ( 'krag )

**Crambinae** [INV ZOO] The snout moths, a subfamily of lepidopteran insects in the family Pyralidae containing small marshland and grassland forms. ( 'kram'bī-nē )

**Cramér-Rao inequality** [STAT] An inequality that is the basis of a method for determining a lower bound to the variance of an estimator of a parameter. ( 'krā'mā'rāu,in-i,kwēl-əd-ē )

**Cramer's rule** [MATH] The method of solving a system of linear equations by means of determinants. ( 'krām-əz,rul )

**cramp** [DES ENG] A metal plate with bent ends used to hold blocks together. [MED] 1. Painful, involuntary contraction of a muscle, such as a leg or foot cramp that may occur in normal individuals at night or in swimming. 2. Any cramplike pain as of the intestine, or that accompanying dysmenorrhea. 3. Spasm of certain muscles, which may be intermittent or constant, from excessive use. ( 'kramp )

**crampon** [DES ENG] A device for holding heavy objects such as rock or lumber to be lifted by a crane or hoist; shaped like scissors, with points bent inward for grasping the load. Also spelled crampon. ( 'kram,pən )

**crampon** See crampon. ( 'kram,pūn )

**cranberry** [BOT] Any of several plants of the genus *Vaccinium*, especially *V. macrocarpon*, in the order Ericales, cultivated for its small, edible berries. ( 'kran,ber-ē )

CRAB NEBULA



Crab Nebula, in the constellation Taurus, emitter of strong radio waves and of x-rays.